

Claims

1. An incandescent lamp with a carbon cycle process, in which a luminous body together with a filling is introduced in a vacuum-tight manner into a bulb, the luminous body including a metal carbide, the melting point of which is above that of tungsten, characterized in that the distance between the luminous body and the wall of the bulb is less than 18 mm, a first cycle process, which is attributed to the carbon, being effected by the use of carbon and at least one further element, in particular hydrogen, as fill additive, and a second cycle process, which is attributed to the metal, being effected by the use of a further element, preferably a halogen.

2. The incandescent lamp as claimed in claim 1, characterized in that the luminous body is a coiled wire or a ribbon, consisting of tantalum carbide at least at its surface.

3. The incandescent lamp as claimed in claim 1, characterized in that the bulb consists of quartz glass or hard glass with a bulb diameter of between 5 mm and 35 mm, preferably between 8 mm and 15 mm.

4. The incandescent lamp as claimed in claim 1, characterized in that the fill contains inert gas, in particular noble gas, if appropriate with additional small quantities of nitrogen, and at least one hydrocarbon, hydrogen and at least one halogen additive.

5. The incandescent lamp as claimed in claim 1, characterized in that the luminous body consists of TaC, ZrC, HfC or an alloy of various carbides, preferably containing TaC, and in particular is a coiled wire.

6. The incandescent lamp as claimed in claim 1, characterized in that the luminous body comprises a core and a coating at its surface, the core in particular being a rhenium wire or a carbon fiber or a bundle of carbon fibers which is/are coated with carbide.

7. The incandescent lamp as claimed in claim 1, characterized in that the dimensions of the bulb are selected in such a way that the bulb wall temperature is between 100°C and 700°C.

8. The incandescent lamp as claimed in claim 7, characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, bromine 0.05% - 0.5%:

- hydrocarbon, preferably CH₄, C₂H₆, C₂H₄, C₂H₂;
- hydrogen (H₂);
- hydrogen bromide HBr or a halogenated hydrocarbon, preferably CH₂Br₂, CHBr₃ or CH₃Br.

9. The incandescent lamp as claimed in claim 1, characterized in that the dimensions of the bulb are selected in such a way that the bulb wall temperature is between 150°C and 900°C.

10. The incandescent lamp as claimed in claim 9, characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, chlorine 0.05% - 0.5%:

- hydrocarbon, preferably CH₄, C₂H₆, C₂H₄, C₂H₂;
- hydrogen (H₂);
- hydrogen chloride HCl or a halogenated

hydrocarbon, preferably CH_2Cl_2 , CHCl_3 , or CH_3Cl .

11. The incandescent lamp as claimed in claim 1, characterized in that the dimensions of the bulb are
5 selected in such a way that the bulb wall temperature is between 150°C and 600°C .

12. The incandescent lamp as claimed in claim 11, characterized in that in addition to the inert gas the
10 following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, iodine 0.05% - 0.5%:

- 15 - hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
- hydrogen (H_2);
- hydrogen iodide HI or iodine I_2 or an iodinated hydrocarbon, preferably CH_3I or $\text{C}_2\text{H}_5\text{I}$.

20 13. The incandescent lamp as claimed in claim 1, characterized in that the total quantity of halogen introduced into the lamp is less than that of the hydrogen, and in particular the total quantity of halogen introduced into the lamp is smaller by a factor
25 of 5 to 25 than the total quantity of hydrogen introduced.

14. The incandescent lamp as claimed in claim 11, characterized in that in addition to the inert gas the
30 following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, iodine 0.1% - 20%:

- 35 - hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
- hydrogen (H_2);
- hydrogen iodide HI or iodine I_2 or an iodinated hydrocarbon, preferably CH_3I or $\text{C}_2\text{H}_5\text{I}$.

15. The incandescent lamp as claimed in claim 9, characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, chlorine 0.05% - 0.5%, iodine 0.1% - 20%:
- hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
 - hydrogen (H_2);
 - 10 - hydrogen chloride HCl or an halogenated hydrocarbon, preferably CH_2Cl_2 , CHCl_3 or CH_3Cl ;
 - hydrogen iodide HI or iodine I_2 or an iodinated hydrocarbon, preferably CH_3I or $\text{C}_2\text{H}_5\text{I}$.
- 15 16. The incandescent lamp as claimed in claim 15, characterized in that the iodine content and the hydrogen content are equal bar a factor of 2.
17. The incandescent lamp as claimed in claim 7, characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, hydrogen 0.2% - 20%, bromine 0.05% - 0.5%, iodine 0.1% - 20%:
- 20 - hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
 - hydrogen (H_2);
 - hydrogen bromide HBr or a brominated hydrocarbon, preferably CH_2Br_2 , CHBr_3 or CH_3Br ;
 - 25 - hydrogen iodide or iodine I_2 or an iodinated hydrocarbon, preferably CH_3I or $\text{C}_2\text{H}_5\text{I}$.
18. The incandescent lamp as claimed in claim 17, characterized in that the iodine content and the hydrogen content are equal bar a factor of 2.
- 35 19. The incandescent lamp as claimed in claim 1, characterized in that an additional carbon/nitrogen cycle process assists the carbon/hydrogen cycle process

and at the same time a halogen is present.

20. The incandescent lamp as claimed in claims 8 or 10
or 12 or 14 or 15 or 17, in which in addition from
5 0.3 mol% to 3 mol% of CN or CS are present in the gas
phase.

21. The incandescent lamp as claimed in claim 1,
characterized in that in addition to the inert gas the
10 following additives are present for the fill in the
bulb, so that the total content in the gas phase, based
on a cold filling pressure of 1 bar, is preferably as
follows (in mol%):

- carbon 0.25% - 5%, sulfur 0.05% - 5%, hydrogen
15 0.5% - 40%,
- hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
- hydrogen (H_2);
- hydrogen sulfide H_2S or carbon disulfide CS_2 or
methyl mercaptan CH_3SH or ethyl mercaptan $\text{C}_2\text{H}_5\text{SH}$ or
20 dimethyl sulfide CH_3CSCH_3 .

22. The incandescent lamp as claimed in claim 21,
characterized in that

- the molar concentration of the total element
25 sulfur introduced into the lamp is lower by a factor of
0.1 to 1 than the molar concentration of the total
element carbon introduced into the lamp, and
- the molar concentration of the total element
hydrogen introduced into the lamp is preferably at
30 least equal to the sum of four times the molar
concentration of carbon and double the molar
concentration of sulfur, in which context in particular
the molar concentration of the hydrogen may be greater
than this minimum quantity by up to factor of 8.

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23. The incandescent lamp as claimed in claim 1,
characterized in that in addition to the inert gas the
following additives are present for the fill in the
bulb, so that the total content in the gas phase, based

on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, sulfur 0.05% - 5%, hydrogen 0.5% - 40%, iodine 0.2% - 40%

- hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;
- 5 - hydrogen (H_2);
- hydrogen sulfide H_2S or carbon disulfide CS_2 or methyl mercaptan CH_3SH or ethyl mercaptan $\text{C}_2\text{H}_5\text{SH}$ or dimethyl sulfide CH_3CSCH_3
- hydrogen iodide HI or methyl iodide CH_3I or ethyl
- 10 iodide $\text{C}_2\text{H}_5\text{I}$.

24. The incandescent lamp as claimed in claim 23, characterized in that

- the molar concentration of the total element
- 15 sulfur introduced into the lamp is lower by a factor of 0.1 to 1 than the molar concentration of the total element carbon introduced into the lamp, and
- the molar concentration of the total element hydrogen introduced into the lamp is preferably at
- 20 least equal to the sum of the molar concentration of carbon multiplied by 4 and the molar concentration of sulfur multiplied by two; in some cases, the molar concentrations of the hydrogen may be greater than the minimum quantity by up to a factor of 8, and
- 25 - the molar concentration of the element iodine introduced into the lamp is between 0.1% and 15% and is lower than the total molar concentration of hydrogen that is present.

30 25. The incandescent lamp as claimed in claim 9, characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as

35 follows (in mol%): carbon 0.25% - 5%, sulfur 0.05% - 5%, hydrogen 0.5% - 40%, chlorine or bromine 0.02% - 0.5% or iodine 0.02% - 40% (if hydrogen to is to be bonded by iodine)

- hydrocarbon, preferably CH_4 , C_2H_6 , C_2H_4 , C_2H_2 ;

- hydrogen (H_2);
- hydrogen sulfide H_2S or carbon disulfide CS_2 or methyl mercaptan CH_3SH or ethyl mercaptan C_2H_5SH or dimethyl sulfide CH_3CSCH_3

- 5 - a halogenated hydrocarbon, e.g. one or two of the following compounds: CH_2Cl_2 , $CHCl_3$, CCl_4 , CH_2Br_2 , CH_3Br , CH_3I , C_2H_5I , HCl , HBr , HI , Cl_2 , Br_2 , I_2 .

26. The incandescent lamp as claimed in claim 25,
10 characterized in that

- the molar concentration of the total element sulfur introduced into the lamp is lower by a factor of 0.1 to 1 than the molar concentration of the total element carbon introduced into the lamp, and
- 15 - the molar concentration of the total element hydrogen introduced into the lamp is preferably at least equal to the sum of the molar concentration of carbon multiplied by 4 and the molar concentration of sulfur multiplied by two and one times the
20 concentration of chlorine or bromine; in some cases the molar concentration of the hydrogen may be greater than the minimum quantity by up to a factor of 8.

27. The incandescent lamp as claimed in claim 11,
25 characterized in that in addition to the inert gas the following additives are present for the fill in the bulb, so that the total content in the gas phase, based on a cold filling pressure of 1 bar, is preferably as follows (in mol%): carbon 0.1% - 5%, sulfur 0.02% - 5%,
30 chlorine 0.42% - 30%,

- carbon tetrachloride CCl_4 , disulfur dichloride S_2Cl_2 or sulfur dichloride SCl_2 , and if appropriate also chlorine Cl_2 or nitrogen trichloride NCl_3 or
- carbon tetrachloride CCl_4 , carbon disulfide CS_2 ,
35 chlorine Cl_2 or nitrogen trichloride NCl_3 .

28. The incandescent lamp as claimed in claim 27, characterized in that the following features are fulfilled:

- the molar concentration of the total element sulfur within the lamp is lower by a factor of 0.1 - 1 than the total quantity of carbon present in the lamp;
 - the molar concentration of chlorine is preferably
- 5 greater than the sum of the molar concentration of carbon multiplied by four and the molar concentration of sulfur multiplied by two.